Appendix Table 1 Classification of Mechanisms of System-related Prescribing Errors

Classification of the underlying mechanisms of system-related errors		
Error Category and Type	**Definition**	**Examples**
Selection Errors		
Selection in ordering	Occurs when a complete order sentence, or a drug or drug product used to assemble an order sentence, is selected incorrectly from a dropdown menu	e.g. prescriber selected heparinised saline instead of heparin; e.g. prescriber selected the wrong form of methylprednisolone injection (see Fig 2)
Selection in construction	Occurs when a particular field (e.g. drug/ formulation/ route/ frequency/ timing) is selected incorrectly from a dropdown menu during the construction of an order sentence	e.g. prescriber ordered **pantoprazole 8mg/hr intra-articular daily 200mg pantoprazole in 500mL normal saline** (the intra-articular route was selected instead of the intended IV infusion) (Cerner)
Selection in editing	Occurs during the editing of an order sentence when an incorrect drug/ formulation/ route/ frequency/ timing is selected from a dropdown menu	e.g. prescriber ordered sodium chloride 0.9% epidural instead of the IV route (see Fig 3)
Construction Errors		
Construction	Occurs during the formation of an order sentence when an incorrect drug/ formulation/ route/ frequency/ timing is entered into the order sentence; the order sentence conflicts with procedural policy; or when an added order comment conflicts with the order sentence	e.g. prescriber ordered a glyceryl trinitrate (GTN) patch at night instead of twice daily as per Hospital B procedure*; e.g. an order for **GTN patch 10mg/24hour, 1 patch mane, order comment: 50mg/24hour** (Cerner) (the prescriber wanted the 50mg patch which delivers a dose of 10mg/24 hours, not 5 patches); e.g. an order for **temazepam 10-20mg PRN sleep,** ancillary information **: minimum dosage interval 10 hours** (MedChart)
Editing Errors		
Editing	Occurs when part of an order sentence is changed, thereby producing an error or an inconsistency within the order	e.g. prescriber ordered a dose of 37.5 tablets of **Stavelo 150** instead of one tablet. e.g. order for Warfarin paper chart exists" **mane (1600)**

		(the order was incorrectly set for a morning administration and then the time of administration was corrected, but not the time of day) (MedChart)
Editing to correct a selection error	Occurs when two errors are made sequentially – a selection in ordering error (see definition above) is made and an editing error (see definition above) occurs during an attempt to correct the first error	e.g**.** an order sentence for oral Keppra tablets was selected and edited to change the route from oral to IV injection, but the ancillary information (swallow whole) for the oral product remained.
New Tasks Required from ePS		
Failure to order reminder	Occurs when a required ancillary prompt is not ordered	e.g. prescriber failed to order a dermal patch removal order, a warfarin check (INR) reminder (Cerner), or a paper chart reminder (MedChart)
Failure to change default time/date	Occurs when the default time or date is not appropriately adjusted e.g. the first dose of a new order falls due at an inappropriate time; or an existing order which is modified <u>before or after</u> the last dose may lead to missed or extra dose(s)	e.g. prescriber ordered **fentanyl 50mcg transdermal patch every three days** ordered at 1346 on Monday. The task fell due immediately and at 1346 every three days thereafter. However the patient refused the dose because the patch was due to be changed at 0800 on Tuesday (MedChart); e.g. an order set consisting of **GTN 5mg/24hr dermal patch once** and **patch removal (GTN patch) once** were ordered at 2345 as a STAT order (with patch application and removal both charted for the same time) (Cerner)
Error associated with ancillary information	Occurs when an order is ceased, but the order for an associated ancillary task is not ceased May also occur when an order is modified (e.g. dose adjustment) but the attached order comment (which is no longer appropriate) is not ceased	e.g. an order for warfarin was ceased, but the associated order for a warfarin check (INR prompt) remained active (Cerner); or vice versa e.g. a paper chart order was ceased, but the associated order for a paper chart alert remained active (MedChart); e.g. order for **lisinopril 5mg mane,** ancillary information**: half a 5mg tab** (the dose was previously 2.5mg, then increased from 2.5 to 5mg, but the ancillary information was not changed)
System limitation	Occurs when system design features	e.g. Hospital B procedure is that

	prevent the construction of a correct order which previously was possible in the paper based system	dermal patches should be prescribed twice daily for inpatient orders (even though ONE patch only per day is intended) so that a task falls due twice daily for nurses to sign once for administration and once for removal of the patch; e.g. Cerner contained many haloperidol sentences, which were divided into subgroups (haloperidol (IV-SC)[1] and haloperidol (IM-IM depot) for easier selection. This meant that **haloperidol (IV-SC)** for SC administration could cause confusion as to the intended route; e.g. unlisted medications did not display the entered dose (Cerner)
System contains incorrect order sentence	Occurs when an existing order sentence available from a dropdown menu contains an error	e.g. Bactroban Nasal Ointment and Bactroban Ointment for topical use were incorrectly cross linked to the topical and nasal routes respectively[2] (Cerner)

GTN = glyceryl trinitrate; mane = (in the) morning; QID = four times a day; PO = per oral; IV = intravenous

*Hospital B procedure is that dermal patches should be prescribed twice daily for inpatient orders (even though ONE patch only per day is intended) so that a task falls due twice daily for nurses to sign once for administration and once for removal of the patch

Explanatory notes:

1. The haloperidol (IV-SC) subgroup was subsequently further divided into haloperidol (IV) and haloperidol (SC) to avoid confusion
2. These sentences have since been corrected

Appendix Table 2 Frequency of system-related errors by mechanism, clinical error type and e-PS

Mechanism	Manifestation - Clinical Error Type													
	Wrong strength	**Wrong formulation**	**Wrong route**	**Wrong timing**	**Wrong drug**	**Wrong rate/frequency**	**Wrong dose unit**	**Duplicated order**	**Drug not indicated**	**Incomplete order**	**Wrong dose**	**Wrong ancillary information**	**Prompt not ordered**	**Total**
MedChart e-PS (system-related errors arising in 465 patient admissions)														
Selection	106	30	0	15	9	1	14	0	0	1	0	2	0	178
Construction	0	1	1	0	0	1	0	0	0	0	0	7	0	10
Editing	0	0	0	59	1	0	0	0	0	0	0	0	0	60
New e-PS tasks	0	0	0	15	0	23	0	1	5	0	0	8	28	80
Total	106	31	1	89	10	25	14	1	5	1	0	17	28	328
Cerner e-PS (system-related errors arising in 164 patient admissions)														
Selection	2	3	16	3	4	0	1	0	0	1	1	5	0	36
Construction	0	0	0	1	0	3	3	0	0	0	0	0	0	7
Editing	2	8	10	5	2	2	0	0	0	2	7	6	0	44
New e-PS tasks	1	0	1	37	8	3	0	0	11	1	3	0	13	78
Total	5	11	27	46	14	8	4	0	11	4	11	11	13	165